What is claimed is:

1. A process of depositing nanowires on an electrically conductive layer formed on a substrate, which process comprises:

forming an organic layer on the electrically conductive layer, the organic layer including a first region and a second region, the first region having an affinity for the nanowires and being electrically conductive; and

contacting the organic layer with a composition including the nanowires dispersed in a compatible solvent for a time sufficient to selectively deposit at least one of the nanowires on the first region of the organic layer.

2. The process of claim 1, wherein the electrically conductive layer is formed by depositing a metal on the substrate.

3. The process of claim 2, wherein the metal is gold.

4. The process of claim 1, wherein forming the organic layer includes depositing a first plurality of organic molecules on the electrically conductive layer to form the first region of the organic layer, each of the first plurality of organic molecules including an anchoring group having an affinity for the electrically conductive layer and a polar group having an affinity for the nanowires.

5. The process of claim 4, wherein the polar group is electrically charged.

6. The process of claim 4, wherein the polar group includes at least one of a nitrogen atom and an oxygen atom.

7. The process of claim 4, wherein each of the first plurality of organic molecules further includes a plurality of conjugated π-bonds.

8. The process of claim 4, wherein at least one of the first plurality of organic molecules is a substituted heteroarene.

9. The process of claim 8, wherein the substituted heteroarene is selected from the group consisting of 4-mercaptopyridine, 2-mercaptoimidazole, and 2-mercaptopyrimidine.

10. The process of claim 4, wherein forming the organic layer further includes depositing a second plurality of organic molecules on the electrically conductive layer to form the second region of the organic layer, each of the second plurality of organic molecules including an anchoring group having an affinity for the electrically conductive layer and a non-polar group substantially lacking an affinity for the nanowires.

11. The process of claim 10, wherein the non-polar group is electrically neutral.

12. The process of claim 10, wherein the non-polar group is a methyl group.

13. The process of claim 10, wherein at least one of the second plurality of organic molecules is a thiol.

14. The process of claim 13, wherein the thiol is 1-octadecanethiol.

15. The process of claim 10, wherein at least one of the first plurality of organic molecules and the second plurality of organic molecules are deposited via dip-pen nanolithography.

16. The process of claim 10, wherein at least one of the first plurality of organic molecules and the second plurality of organic molecules are deposited via microcontact printing.

17. The process of claim 10, wherein at least one of the first plurality of organic molecules and the second plurality of organic molecules are deposited via photolithography.

18. The process of claim 1, wherein the compatible solvent is a halogenated organic solvent.

19. The process of claim 18, wherein the halogenated organic solvent is a dihalogenated benzene.

20. The process of claim 19, wherein the dihalogenated benzene is 1,2-dichlorobenzene.

21. The process of claim 1, which further comprises:

dispersing the nanowires in the compatible solvent to form the composition.

22. The process of claim 21, wherein dispersing the nanowires in the compatible solvent includes selecting a concentration of the nanowires in the composition to selectively deposit a single one of the nanowires on the first region of the organic layer.

23. The process of claim 21, wherein dispersing the nanowires in the compatible solvent includes selecting a concentration of the nanowires in the composition to selectively deposit at least two of the nanowires on the first region of the organic layer.

24. The process of claim 1, wherein a concentration of the nanowires in the composition is in the range of about 0.02 mg of the nanowires per 100 ml of the compatible solvent to about 20 mg of the nanowires per 100 ml of the compatible organic solvent.

25. The process of claim 1, which further comprises:

removing impurities from the composition prior to contacting the organic layer with the composition.

26. The process of claim 1, wherein contacting the organic layer with the composition includes contacting the organic layer with the composition in a substantially stationary state.

27. The process of claim 26, wherein the first region of the organic layer is elongated, and at least one of the nanowires is selectively deposited on the first region of the organic layer to be substantially aligned with the first region of the organic layer.

28. The process of claim 1, wherein contacting the organic layer with the composition includes immersing the organic layer in the composition.

29. The process of claim 1, wherein contacting the organic layer with the composition includes contacting the organic layer with the composition substantially in the absence of an applied electric field.

30. The process of claim 29, wherein the first region of the organic layer is elongated, and at least one of the nanowires is selectively deposited on the first region of the organic layer to be substantially aligned with the first region of the organic layer.

31. The process of claim 1, wherein the first region of the organic layer includes a pair of domains that are spaced apart from one another, and at least one of the nanowires is selectively deposited on the first region of the organic layer to couple the pair of domains.

32. The process of claim 1, which further comprises:

removing the compatible solvent while at least one of the nanowires remains deposited on the first region of the organic layer.

33. The process of claim 32, wherein removing the compatible solvent includes evaporating the compatible solvent in an inert atmosphere.

34. A process of depositing nanowires on a substrate, which process comprises:

forming a pair of electrical contacts on the substrate, the pair of electrical contacts being spaced apart from one another;

depositing a first plurality of organic molecules on the pair of electrical contacts, the first plurality of organic molecules having an affinity for the nanowires and being electrically conductive;

depositing a second plurality of organic molecules on the substrate between the pair of electrical contacts, the second plurality of organic molecules substantially lacking an affinity for the nanowires; and

contacting the pair of electrical contacts including the first plurality of organic molecules deposited thereon with a composition including the nanowires dispersed in a compatible solvent for a time sufficient so that at least one of the nanowires is deposited to electrically couple the pair of electrical contacts.

35. The process of claim 34, wherein forming the pair of electrical contacts includes:

forming a photoresist layer on the substrate;

patterning the photoresist layer to form a pair of trenches; and

depositing an electrically conductive material in the pair of trenches to form the pair of electrical contacts.

36. The process of claim 35, wherein the electrically conductive material includes at least one of a metal and a metal oxide.

37. The process of claim 34, wherein each of the first plurality of organic molecules includes a polar group having an electrostatic affinity for the nanowires.

38. The process of claim 37, wherein depositing the first plurality of organic molecules includes depositing the first plurality of organic molecules so that the polar groups of the first plurality of organic molecules are exposed.

39. The process of claim 37, wherein each of the first plurality of organic molecules further includes a plurality of conjugated π-bonds.

40. The process of claim 34, wherein each of the second plurality of organic molecules includes a non-polar group substantially lacking an electrostatic affinity for the nanowires.

41. The process of claim 40, wherein depositing the second plurality of organic molecules includes depositing the second plurality of organic molecules so that the non-polar groups of the second plurality of organic molecules are exposed.

42. The process of claim 34, wherein the compatible solvent is a halogenated organic solvent.

43. The process of claim 42, wherein the halogenated organic solvent is a dihalogenated benzene.

44. The process of claim 43, wherein the dihalogenated benzene is 1,2-dichlorobenzene.

45. The process of claim 34, which further comprises:
dispersing the nanowires in the compatible solvent to form the composition.

46. The process of claim 45, wherein dispersing the nanowires in the compatible solvent includes selecting a concentration of the nanowires in the composition so that a single one of the nanowires is deposited to electrically couple the pair of electrical contacts.

47. The process of claim 45, wherein dispersing the nanowires in the solvent includes selecting a concentration of the nanowires in the composition so that at least two of the nanowires is deposited to electrically couple the pair of electrical contacts.

48. The process of claim 34, wherein contacting the pair of electrical contacts with the composition includes contacting the pair of electrical contacts with the composition in a substantially stationary state.

49. The process of claim 34, wherein contacting the pair of electrical contacts with the composition includes contacting the pair of electrical contacts with the composition substantially in the absence of an applied electric field.

50. The process of claim 34, which further comprises:

removing the compatible solvent while at least one of the nanowires remains deposited to electrically couple the pair of electrical contacts.

51. A process of depositing nanowires on a substrate, which process comprises:

depositing a first plurality of organic molecules on the substrate to form a plurality of domains that are spaced apart from one another, each of the first plurality of organic molecules including a plurality of conjugated π-bonds and an exposed polar group;

providing a composition including the nanowires dispersed in a compatible solvent; and

contacting the substrate including the first plurality of organic molecules deposited thereon with the composition for a time sufficient so that each of the plurality of domains includes at least one of the nanowires deposited thereon.

52. The process of claim 51, which further comprises:

depositing an electrically conductive material on the substrate to form an electrically conductive layer, the first plurality of organic molecules being deposited on the electrically conductive layer.

53. The process of claim 51, wherein depositing the first plurality of organic molecules includes depositing the first plurality of organic molecules via one of dip-pen nanolithography, microcontact printing, and photolithography.

54. The process of claim 53, wherein depositing the first plurality of organic molecules via photolithography includes:

forming a photoresist layer on the substrate;

patterning the photoresist layer to form a plurality of trenches; and

depositing the first plurality of organic molecules in the plurality of trenches to form the plurality of domains.

55. The process of claim 54, which further comprises:

removing the patterned photoresist layer while retaining the plurality domains on the substrate; and

depositing a second plurality of organic molecules on the substrate to surround the plurality of domains, each of the second plurality of organic molecules including an exposed non-polar group.

56. The process of claim 51, wherein depositing the first plurality of organic molecules includes:

depositing the first plurality of organic molecules on the substrate to form an organic layer; and

patterning the organic layer to form the plurality of domains.

57. The process of claim 56, which further comprises:

depositing a second plurality of organic molecules on the substrate to surround the plurality of domains, each of the second plurality of organic molecules including an exposed non-polar group.

58. The process of claim 51, wherein depositing the first plurality of organic molecules includes:

depositing a second plurality of organic molecules on the substrate to form an organic layer, each of the second plurality of organic molecules including an exposed non-polar group;

patterning the organic layer to form a plurality of trenches; and

depositing the first plurality of organic molecules in the plurality of trenches to form the plurality of domains.

59. The process of claim 51, wherein the compatible solvent is a halogenated organic solvent.

60. The process of claim 59, wherein the halogenated organic solvent is a dihalogenated benzene.

61. The process of claim 60, wherein the dihalogenated benzene is 1,2-dichlorobenzene.

62. The process of claim 51, wherein providing the compositing includes selecting a concentration of the nanowires in the composition so that each of the plurality of domains includes a single one of the nanowires deposited thereon.

63. The process of claim 51, wherein providing the compositing includes selecting a concentration of the nanowires in the composition so that each of the plurality of domains includes at least two of the nanowires deposited thereon.

64. The process of claim 51, wherein contacting the substrate with the composition includes contacting the substrate with the composition in a substantially stationary state and substantially in the absence of an applied electric field.

65. The process of claim 64, wherein each of the plurality of domains is elongated and includes at least one of the nanowires deposited thereon and substantially aligned therewith.

66. The process of claim 65, wherein at least two of the plurality of domains have different orientations.

67. A process of depositing nanowires on a substrate, which process comprises:

depositing a plurality of organic molecules on an area of the substrate, each of the plurality of organic molecules including an exposed non-polar group;

providing a composition including the nanowires dispersed in a halogenated organic solvent; and

contacting the substrate including the plurality of organic molecules deposited thereon with the composition for a time sufficient to selectively deposit at least one of the nanowires on a remaining area of the substrate not having the plurality of organic molecules deposited thereon.

68. The process of claim 67, wherein the non-polar group is electrically neutral.

69. The process of claim 67, wherein the non-polar group is a methyl group.

70. The process of claim 67, wherein at least one of the plurality of organic molecules is a thiol.

71. The process of claim 67, wherein the thiol is 1-octadecanethiol.

72. The process of claim 67, wherein the plurality of organic molecules are deposited via dip-pen nanolithography.

73. The process of claim 67, wherein the plurality of organic molecules are deposited via microcontact printing.

74. The process of claim 67, wherein the plurality of organic molecules are deposited via photolithography.

75. The process of claim 67, wherein contacting the substrate with the composition includes contacting the substrate with the composition in a substantially stationary state.

76. The process of claim 67, wherein contacting the substrate with the composition includes contacting the substrate with the composition substantially in the absence of an applied electric field.

77. The process of claim 67, wherein the remaining area of the substrate is elongated, and at least one of the nanowires is selectively deposited on the remaining area of the substrate to be substantially aligned with the remaining area of the substrate.

78. A process of depositing nanowires on an electrically conductive layer formed on a substrate, which process comprises:

forming a patterned layer on the electrically conductive layer, the patterned layer including a first region and a second region, the first region of the patterned layer having an affinity for the nanowires and being electrically conductive, the second region of the patterned layer substantially lacking an affinity for the nanowires; and

contacting the patterned layer with a composition including the nanowires dispersed in a compatible solvent for a time sufficient to selectively deposit at least one of the nanowires on the first region of the patterned layer.

79. The process of claim 78, wherein the electrically conductive layer is formed by depositing a metal on the substrate.

80. The process of claim 79, wherein the metal is gold.

81. The process of claim 78, wherein forming the patterned layer includes depositing a first plurality of organic molecules on the electrically conductive layer to form the first region of the patterned layer, each of the first plurality of organic molecules including an exposed polar group.

82. The process of claim 81, wherein each of the first plurality of organic molecules further includes a plurality of conjugated π-bonds.

83. The process of claim 81, wherein forming the patterned layer further includes depositing a second plurality of organic molecules on the electrically conductive layer to form the second region of the patterned layer, each of the second plurality of organic molecules including an exposed non-polar group.

84. The process of claim 78, wherein the compatible solvent is a halogenated organic solvent.

85. The process of claim 84, wherein the halogenated organic solvent is a dihalogenated benzene.

86. The process of claim 85, wherein the dihalogenated benzene is 1,2-dichlorobenzene.

87. The process of claim 78, wherein a concentration of the nanowires in the composition is in the range of about 0.02 mg of the nanowires per 100 ml of the compatible solvent to about 20 mg of the nanowires per 100 ml of the compatible solvent.

88. The process of claim 78, wherein contacting the patterned layer with the composition includes contacting the patterned layer with the composition in a substantially stationary state.

89. The process of claim 88, wherein the first region of the patterned layer is elongated, and at least one of the nanowires is selectively deposited on the first region of the patterned layer to be substantially aligned with the first region of the patterned layer.

90. The process of claim 78, wherein contacting the patterned layer with the composition includes contacting the patterned layer with the composition substantially in the absence of an applied electric field.

91. The process of claim 90, wherein the first region of the patterned layer is elongated, and at least one of the nanowires is selectively deposited on the first region of the patterned layer to be substantially aligned with the first region of the patterned layer.

92. A nanowire-based device, which comprises:

an electrically conductive layer;

an organic layer positioned on the electrically conductive layer, the organic layer being formed of a plurality of organic molecules each including a plurality of conjugated π-bonds; and

a nanowire positioned on the organic layer.

93. The nanowire-based device of claim 92, wherein the electrically conductive layer includes a metal.

94. The nanowire-based device of claim 93, wherein the metal is gold.

95. The nanowire-based device of claim 92, wherein each of the plurality of organic molecules further includes an anchoring group having an affinity for the electrically conductive layer and a polar group having an affinity for the nanowire.

96. The nanowire-based device of claim 95, wherein the polar group is electrically charged.

97. The nanowire-based device of claim 95, wherein the polar group includes at least one of a nitrogen atom and an oxygen atom.

98. The nanowire-based device of claim 95, wherein at least one of the plurality of organic molecules is a substituted heteroarene.

99. The nanowire-based device of claim 98, wherein the substituted heteroarene is selected from the group consisting of 4-mercaptopyridine, 2-mercaptoimidazole, and 2-mercaptopyrimidine.

100. The nanowire-based device of claim 92, wherein the organic layer is elongated, and the nanowire is positioned on the organic layer to be substantially aligned with the organic layer.

101. The nanowire-based device of claim 92, wherein the organic layer includes a pair of domains that are spaced apart from one another, and the nanowire is positioned on the organic layer to couple the pair of domains.

102. A nanowire-based device, which comprises:

a substrate;

a pair of electrical contacts formed on the substrate, the pair of electrical contacts being spaced apart from one another;

a first plurality of organic molecules deposited on the pair of electrical contacts, the first plurality of organic molecules being electrically conductive and each including a polar group; and

a first nanowire deposited on the first plurality of organic molecules to electrically couple the pair of electrical contacts.

103. The nanowire-based device of claim 102, wherein the pair of electrical contacts includes at least one of a metal and a metal oxide.

104. The nanowire-based device of claim 102, wherein the polar group has an electrostatic affinity for the first nanowire.

105. The nanowire-based device of claim 102, wherein each of the first plurality of organic molecules further includes a plurality of conjugated π-bonds.

106. The nanowire-based device of claim 102, which further comprises:

a second plurality of organic molecules deposited on the substrate between the pair of electrical contacts, the second plurality of organic molecules each including a non-polar group.

107. The nanowire-based device of claim 106, wherein the non-polar group substantially lacks an electrostatic affinity for the first nanowire.

108. The nanowire-based device of claim 102, which further comprises:

a second nanowire deposited on the first plurality of organic molecules to electrically couple the pair of electrical contacts.